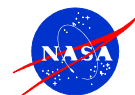




STATEMENT OF BASIS

MLP/VAB AREA SWMU 56 NATIONAL AERONAUTICS AND SPACE ADMINISTRATION KENNEDY SPACE CENTER BREVARD COUNTY, FLORIDA



PURPOSE OF STATEMENT OF BASIS

This Statement of Basis (SB) has been developed to inform and give the public an opportunity to comment on the proposed remedy to address contamination at the Mobile Launch Platform Rehabilitation Sites and the Vehicle Assembly Building (MLP/VAB Area)¹. The MLP/VAB Area includes the three MLP Rehabilitation Sites and the VAB as well as groundwater impacted by volatile organic compounds (VOCs) and ammonia at the KSC Press Site (SWMU 74), the Former Saturn-V Rocket Display Area (SWMU 80), and the Orbiter Processing Facility-3 (SWMU 83). A Kennedy Space Center (KSC) Remediation Team consisting of National Aeronautics and Space Administration (NASA) and Florida Department of Environmental Protection (FDEP) personnel has determined that the proposed remedy is cost effective and protective of human health and the environment. However, prior to implementation of the proposed remedy, the KSC Remediation Team would like to give an opportunity for the public to comment on the proposed remedy. At any time during the public comment period, the public may comment as explained in the "How Do You Participate" section of this SB. After the end of the public comment period, the KSC Remediation Team will review all comments and issues raised in the comments and determine if there is a need to modify the proposed remedy prior to implementation.

WHY IS A REMEDY NEEDED?

The results of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) indicated that several VOCs and ammonia listed in Table 1 are present in groundwater, which could be potentially harmful to human health if this water was used for human consumption now or in the future. In addition, the results of the RFI indicated that benzo(a)pyrene and polychlorinated biphenyls (PCBs) listed on Table 2 are present in swale soil, which could potentially be harmful to human health.

HOW DO YOU PARTICIPATE?

The KSC Remediation Team solicits public review and comment on this SB before implementing the proposed remedy. The remedy for the MLP/VAB Area will eventually be incorporated into the Hazardous and Solid Waste Amendments (HSWA) Permit for KSC.

The Cleanup Remedy

The proposed cleanup remedy for the MLP/VAB Area includes the following components:

- enhanced bioremediation of the VOC source area.
- biosparging in conjunction with Monitored Natural Attenuation (MNA) for the VOC dissolved plume.
- Monitoring of groundwater to document water quality and contaminant levels.
- Implementation of institutional controls to prohibit residential exposure to site surface soils and prohibit the use of groundwater as a potable water supply.

1. In accordance with RCRA §7004(b), this Statement of Basis summarizes the proposed remedy for the NASA MLP/VAB Area. For detailed information on the site, consult the MLP/VAB Area CMS Report, which is available for review at the information repository located at the North Brevard Library, 2121 South Hopkins Avenue, Titusville, FL 32780, telephone: (321) 264-5026.

(Rev 1)

The public comment period for this SB and proposed remedy will begin on the date of publication for notice of availability of the SB in major local newspapers of general circulation and end 45 days thereafter. If requested during the comment period, the KSC Remediation Team will hold a public meeting to respond to any oral comments or questions regarding the proposed remedy. To request a hearing or provide comments, contact the following person in writing within the 45-day comment period:

Mr. John R. Armstrong, P.G.
FDEP - Bureau of Waste Cleanup
2600 Blair Stone Road, MS 4535
Tallahassee, FL 32399-2400

The HSWA Permit, SB, and associated administrative file, including the Corrective Measures Study (CMS) Report, will be available to the public for viewing and copying at:

NASA Document Library
North Brevard Library
2121 South Hopkins Avenue
Titusville, FL 32780
Telephone: (321) 264-5026

To request further information, you may contact one of the following people:

Mr. Harold Williams
Remediation Program Manager
Environmental Program Office
Mail Code: TA-C3
Kennedy Space Center, FL 32899
E-mail: Harold.G.Williams@nasa.gov
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Mr. John R. Armstrong, P.G.
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Telephone: (850) 245-8981

FACILITY DESCRIPTION

NASA established the KSC as the primary launch site for the space program. These operations have involved the use of toxic and hazardous materials. Under the RCRA and applicable HSWA permit (Permit No. FL6800014585) issued by the FDEP, KSC was required to perform an investigation to determine the nature and extent of contamination from Solid Waste Management Unit (SWMU) No. 56, the MLP/VAB Area.

SITE DESCRIPTION AND HISTORY

The MLP and the VAB are active NASA-operated facilities which were originally built to support Apollo/Saturn-V vehicle assembly and later modified (1976) to support Space Transportation System (STS) shuttle missions. Construction of the MLP and VAB started approximately in 1963 and was completed in 1966.

SWMU No. 56 includes the three MLP Rehabilitation Sites and the VAB. The MLP/VAB Area is shown on Figure 1. For remediation purposes, the VOCs present in groundwater at the KSC Press Site (SWMU 74), the Former Saturn-V Rocket Display Area (SWMU 80), and the Orbiter Processing Facility-3 (SWMU 83) have all been incorporated into SWMU 56.

Historically the MLP sites (East Rehab Site, Central Rehab Site, and West Rehab Site) were used to repair post launch corrosion and/or blast damage on the launch platforms prior to their reuse. The MLP sites were the original construction sites for the three Apollo Mobile Launchers. The MLP sites encompass approximately 17 acres. The VAB is used to stack and prepare the space vehicles prior to launch. Historically Apollo and currently Shuttle vehicles are assembled vertically inside the VAB. The Space shuttles solid rocket booster segments, external tank, and the orbiter

are processed and mated inside the VAB. The footprint of the VAB building covers an area of approximately 8 acres. Investigations conducted at the site include:

- 1993 – 1996: Preliminary investigations at the MLP Rehabilitations Sites focused on identifying potential contamination in soil and groundwater from refurbishment activities at the site. Results indicated that metals and polynuclear aromatic hydrocarbons were present in soil and VOCs in groundwater. These results lead to initiating a RCRA Facility Investigation (RFI) at the site. An RFI Work Plan for the site was approved in 1996.
- 1997 – 1999: The RFI was conducted to characterize the nature and extent of contamination at the site. Samples of soil/sediment, surface water, and groundwater were collected and analyzed to evaluate potential risks to human health and ecological receptors. RFI results indicated that elevated polychlorinated biphenyls (PCBs) and zinc were present in soil adjacent to the East MLP Rehabilitation Site. An interim measure (IM) to remove the impacted soils was performed between May 1999 and February 2000. A Preliminary Risk Evaluation (PRE) was conducted for groundwater to determine if the elevated VOC and ammonia concentrations identified would result in an unacceptable human health risk if the groundwater was used as a source of drinking water. The human health risk assessment (HHRA) performed for soil/sediment (swale soil) indicated that no further action other than the IM was needed for industrial use of soils in the MLP Area. Unacceptable risks to potential residential receptors were identified northwest of the VAB; therefore, implementation of institutional controls to prohibit residential exposure to site surface soils in this area is required. The ecological risk assessment (ERA) performed for soil/sediment (swale

soil) indicated that no unacceptable risk exists at the site for ecological receptors.

- 2000 – 2003: Post RFI/Pre-CMS activities were performed to evaluate potential sources of VOCs, evaluate the distribution of ammonia in groundwater, evaluate the presence of dense non-aqueous phase liquid (DNAPL) underlying the parking lot northeast of the VAB footprint, evaluate the performance and applicability of biostimulation and bioaugmentation for biodegrading TCE in groundwater via laboratory microcosms, continue monitoring plume degradation and/or stability in the area, evaluate aquifer characteristics, and collect data necessary to further evaluate the applicability of potential available technologies at the MLP/VAB Area.
- 2003: A RCRA CMS was conducted to identify and evaluate potential technologies that may be appropriate for reducing contaminants present in site groundwater to acceptable regulatory cleanup target levels.

SUMMARY OF SITE RISK

As part of the RFI activities, risk assessments were completed in accordance with KSC's Remediation Team Risk Assessment Decision Process Document (DPD). The ERA was performed in accordance with the eight-step process described in the EPA's "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments", dated 1997.

Chemicals of Concern (COCs) identified for human health during the RFI included VOCs and ammonia in groundwater. Table 1 lists the COCs present in groundwater at the site. The PRE for human health indicated that groundwater containing VOCs and ammonia, would result in an unacceptable human health risk if the groundwater was used as a source of drinking water.

The HHRA performed indicated that no further action for site soils other than the IM was warranted in the MLP Area. Unacceptable risks to potential residential receptors were identified northwest of the VAB; therefore, implementation of institutional controls to prohibit residential exposure to site surface soils in this area is required.

The ecological risk assessment (ERA) performed for swale soil indicated that no unacceptable risk exists at the site for ecological receptors. Table 2 lists the COCs identified in swale soil at the site.

WHAT ARE THE REMEDY OBJECTIVES AND LEVELS?

The remedial action objective (RAO) is to limit the site to industrial uses and protect humans from exposure to groundwater by preventing its use as a drinking water source in the shallow aquifer where contaminant concentrations are higher than regulatory standards. Table 1 lists the COCs present in groundwater at the MLP/VAB Area. The first column lists the chemical name, the second column lists the range of concentrations in groundwater detected at the MLP/VAB Area based upon post-RFI/Pre-CMS groundwater sampling results, and the last column presents the FDEP cleanup target level to be achieved at the site.

Table 1

Site-Related Chemicals of Concern (COCs)	Range of Detections ¹ (µg/L)	Site-Specific Cleanup Level ² (µg/L)
Trichloroethene	0.5 – 4,310	3
Trans-1,2-dichloroethene	0.36 - 150	100
Cis-1,2-dichloroethene	0.25 – 9,050	70
Vinyl chloride	0.48 - 8,680	1
Ammonia	<200 – 4,800	2,800

¹ Detections in monitoring wells

² Cleanup levels are GCTLs from Florida Administrative Code 62-777

Table 2

Site-Related Chemicals of Concern (COCs)	Range of Detections (mg/kg)	Residential SCTL ¹	Industrial SCTL ¹
Aroclor 1260	0.214 - 0.641	0.5	2.1 ³
Benzo(a)pyrene	0.0507 – 0.302	0.1	0.5

¹ Cleanup levels are SCTLs from Florida Administrative Code 62-777

² Alternative Cleanup Target Level based on groundskeeper scenario presented in RFI Report

³ Industrial SCTL is for Total PCBs

REMEDIAL ALTERNATIVES FOR THE MLP/VAB AREA

Because of the aerial extent (approximately 115 acres) of the groundwater contamination (VOCs and ammonia) associated with the MLP/VAB Area and the trichloroethene (TCE) source area identified north of the VAB a number of remedial alternatives were evaluated during the CMS. The alternatives evaluated for the TCE

2. By separate MOA effective February 23, 2001, with the EPA and FDEP, KSC, on behalf of NASA, agreed to implement Centerwide, certain periodic site inspections, condition certification, and agency notification procedures designed to ensure the maintenance by Center personnel of any site-specific LUCs deemed necessary for future protection of human health and the environment. A fundamental premise underlying execution of that agreement was that through the Center's substantial good faith compliance with the procedures called for herein, reasonable assurances would be provided to EPA and FDEP as to the permanency of those remedies which included the use of specific LUCs.

Although the terms and conditions of the MOA are not specifically incorporated or made enforceable herein by reference, it is understood and agreed by NASA KSC, EPA and FDEP that the contemplated permanence of the remedy reflected herein shall be dependent upon the Center's substantial good faith compliance with the specific LUC maintenance commitments reflected herein. Should such compliance not occur or should the MOA be terminated, it is understood that the protectiveness of the remedy concurred in may be reconsidered and that additional measures may need to be taken to adequately ensure necessary future protection of human health and the environment.

source area and the dissolved VOC and ammonia plume follow.

TCE Source Area:

- source area in-situ chemical oxidation;
- enhanced bioremediation; and
- groundwater extraction and treatment (pump and treat).

Dissolved VOC and ammonia Plume:

- monitored natural attenuation (MNA);
- MNA with biosparging; and
- MNA with groundwater extraction and treatment.

In addition to remedial measures, institutional controls will be implemented for site groundwater. The institutional controls will limit the use of groundwater as a drinking water source in the MLP/VAB Area and swale soil residential exposure northwest of the VAB. NASA, EPA and FDEP have entered into a Memorandum of Agreement (MOA), which outlines how institutional controls will be managed at NASA². The MOA requires periodic inspections, condition certification, and agency notification. The areas of the site that will be under institutional control are shown on Figure 2.

FINAL REMEDY

The final corrective measure for groundwater is enhanced bioremediation for the VOC source area and biosparging in conjunction with MNA (monitoring of COCs) for the VOC dissolved plume. Figure 3 shows the approximate location of the proposed enhanced bioremediation area and the biosparging area.

Enhanced Bioremediation: Enhanced bioremediation involves the addition of nutrients to the subsurface to promote an accelerated rate of chlorinated volatile organic constituent (CVOC) remediation by the naturally occurring

microorganisms present in the subsurface. Nutrients will be provided to the microorganisms via a nutrient delivery system. The enhanced bioremediation remedy will require a number of years to meet corrective measures objectives (CMOs), since the reduction of COCs will be gradual as the elevated source area concentrations degrade. The microcosm studies performed using site soil and groundwater support the ability of enhanced bioremediation to ultimately attain CMOs. Enhanced bioremediation is a technology which has the flexibility to deal with changes and can be easily modified in the event the technology does not meet cleanup expectations within the estimated time.

Biosparging and Monitored Natural

Attenuation: Biosparging is an in-situ remediation technology that uses indigenous microorganisms to reduce organic constituents in the saturated zone. In biosparging, air and nutrients are injected into the saturated zone to increase biological activity of the indigenous microorganisms to promote biodegradation of COCs by providing an aerobic environment. Groundwater will be regularly sampled and analyzed to monitor and document the decrease in contaminant concentrations.

MNA entails the use of natural processes (chemical, physical, and biological) to reduce CVOC concentrations. Chemical MNA processes include volatilization, sorption, and hydrolysis. Physical MNA processes include dilution due to infiltration, advection, and dispersion. Biological MNA processes include biological consumption due to electron acceptor reactions (reductive dehalogenation), electron donor reactions, and cometabolism. All of these processes combine to reduce CVOC concentrations over time.

Institutional Controls: In addition to active remediation, institutional controls will be implemented for site soil and groundwater. The institutional controls will prohibit residential

exposure to site surface soil and prohibit the use of groundwater as a potable water supply.

EVALUATION OF REMEDIES

The remedial alternatives were evaluated to determine if they will comply with EPA's four threshold criteria for corrective measures. The four threshold criteria for corrective measures are:

- overall protection of human health and the environment;
- attain media cleanup standards;
- control the sources of releases; and
- comply with standards for management of wastes.

The five balancing criteria are:

- long term reliability and effectiveness;
- reduction in the toxicity, mobility, or volume of wastes;
- short term effectiveness;
- implementability; and
- cost.

Source area enhanced bioremediation in combination with dissolved VOC plume biosparging and MNA was determined by the KSC Remediation Team to be the best overall remedial approach. The recommended approach provides for the enhancement of identified natural degradation processes in the VOC source area, prevents the potential spread of the VOC plume northeast of the VAB towards a wetland area, and provides a mechanism for monitoring low VOC and ammonia concentrations in the MLP/VAB Area to confirm that COC concentrations are declining over time.

WHAT IMPACTS WOULD THE REMEDY HAVE ON THE LOCAL COMMUNITY?

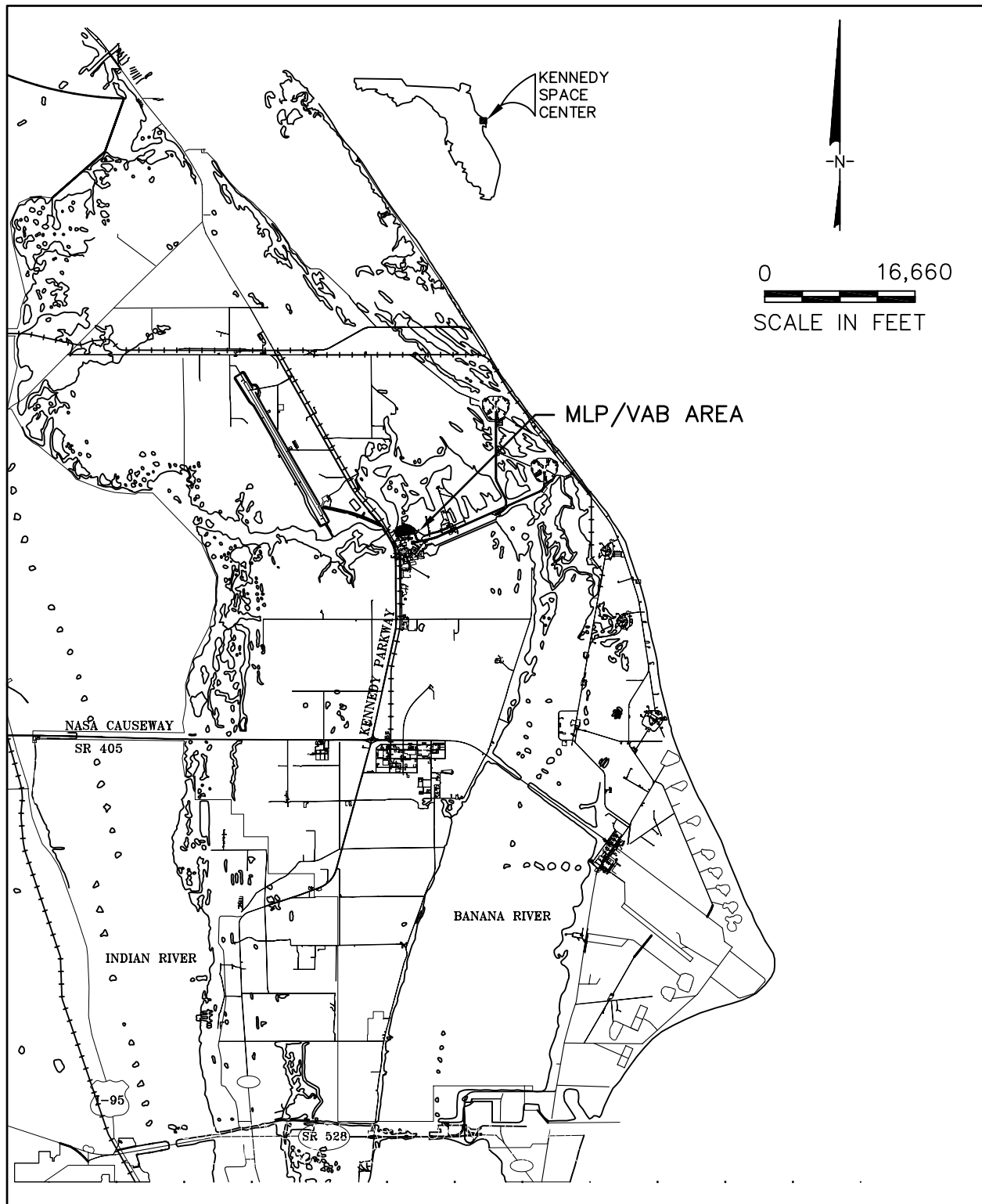
There would be no impacts to the local community because groundwater is not used for potable water at KSC. The proposed remedy includes administrative actions to limit the use of groundwater until the cleanup levels have been reached. Long term groundwater monitoring will be used to monitor and document reduction in contamination concentrations to the cleanup target levels. The institutional controls will also prevent exposure to contaminants prior to the cleanup levels being achieved. The proposed remedy meets the four general standards for corrective measures and was determined to be the best overall approach.

WHY DOES THE KSC REMEDIATION TEAM RECOMMEND THIS REMEDY?

The team recommends the proposed remedy because the institutional controls will prevent exposure to contaminants prior to the cleanup levels being achieved. The proposed remedy meets the four general standards for corrective measures and was determined to be the best overall approach.

NEXT STEPS

The KSC Remediation Team will review all comments on this SB to determine if the proposed remedy needs modification prior to implementation and prior to incorporating the proposed remedy into KSC's HSWA permit. If the proposed remedy is determined to be appropriate for implementation, then the Corrective Measure will be initiated, and a Land Use Control Implementation Plan will be developed to incorporate the institutional controls at this site.



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FIGURE 1
KENNEDY SPACE CENTER
MLP/VAB AREA

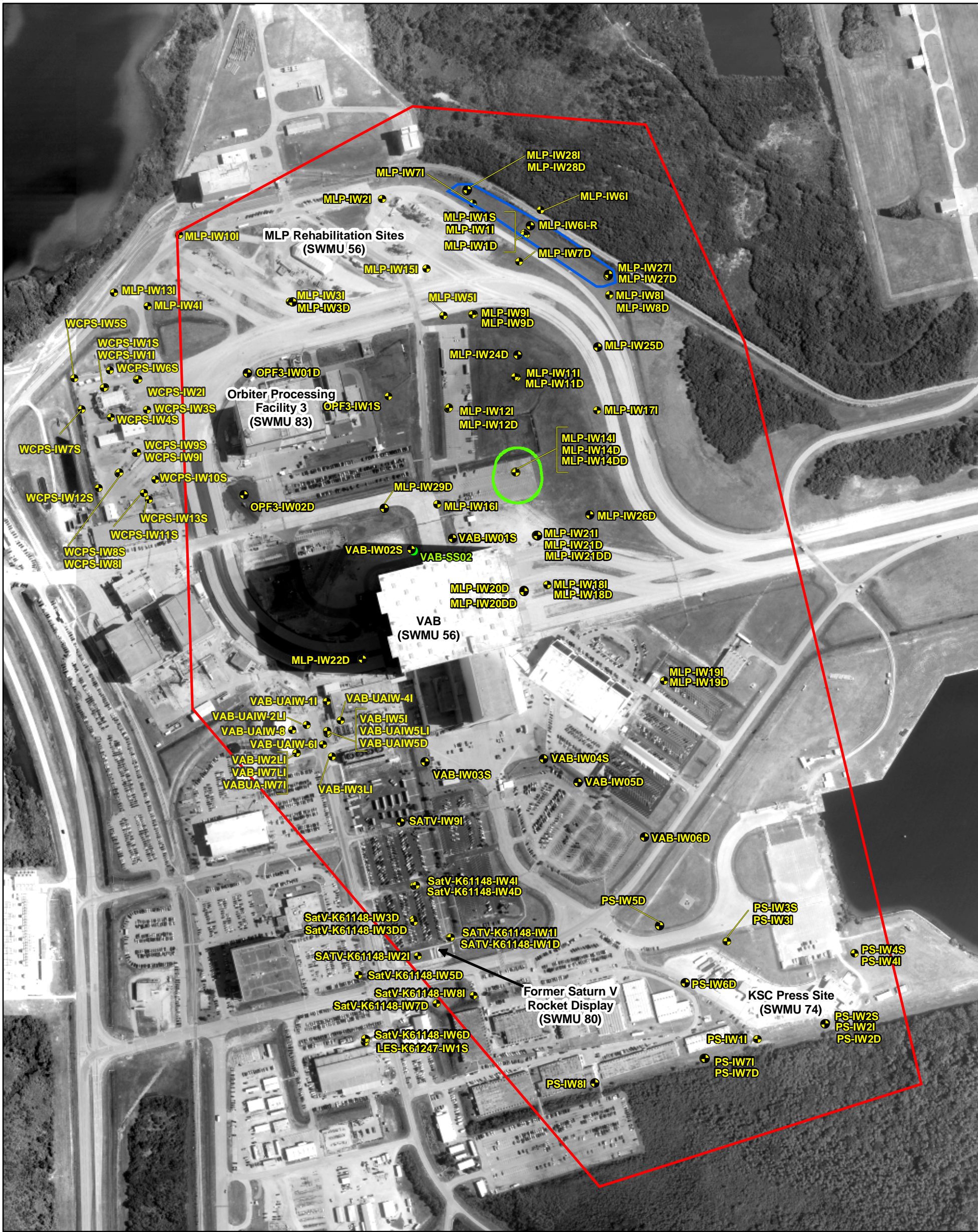


Figure 3
MLP/VAB (SWMU 56) Area
Proposed Groundwater Remediation Technologies

- Monitoring well location
- Surface soil sampling location

- Proposed Bioaspharing Area
- Proposed Enhanced Bioremediation Area
- Area Covered by Statement of Basis and Groundwater Use Control Area

